

Analysis Center of Saint Petersburg University

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Abstract

This report briefly summarizes the activities of the Analysis Center of Saint Petersburg University during 2012. The current status, as well as our future plans, are described.

1. Introduction

The Analysis Center of Saint Petersburg University (SPU AC) was established in the Sobolev Astronomical Institute of the SPb University in 1998. The main activity of the SPU AC for the International VLBI Service before 2007 consisted of routine processing of 24-hour and one-hour observational sessions for obtaining Earth Orientation Parameters (EOP) and rapid UT1-UTC values, respectively. In 2008 we began submitting results of 24-hour session processing.

2. Staff

The assistant professor of Saint Petersburg University, Dmitriy Trofimov, was in charge of the routine processing of the VLBI observations. General coordination and support for the activities of the SPU AC at the Astronomical Institute was performed by Professor Veniamin Vityazev.

3. Activities in 2012

- In 2012, the routine estimation of the five Earth Orientation Parameters was performed. The OCCAM software package (version 6_2) was used for current processing of VLBI data [1]. The time series is named spu00004.eops. It includes data obtained by the IRIS-A, NEOS-A, R1, R4, RDV, and R&D observing programs, and it covers 25 years of observations (from January 2, 1989 until the end of 2012). The total number of experiments processed at the SPU AC is about 1870, of which about 100 VLBI sessions were processed in 2012. We also complemented our series for 2011 by 118 sessions not processed before. Our experience and the equipment of the Analysis Center was used for giving lectures and practical work on the basics of radio interferometry for university students. We use our original manual on the training in modern astrometry, in particular, VLBI [2].

In 2012, the work of the SPU AC was performed within the projects “Acquisition and analysis of time-series in astronomy and study of astronomical catalogs” and “GLONASS, GPS and VLBI observations as the basis of astronomical, gravimetric, and geodynamic studies” (the SPU grants for fundamental research).

- All parameters were adjusted using the Kalman filter technique. For all stations (except the reference station), the wet delay, clock offsets, clock rates, and troposphere gradients were estimated. Troposphere wet delay and clock offsets were modeled as a stochastic process such as a random walk. The clock rates and the troposphere gradients were considered to be the constant parameters.

- The main details of the preparation of the EOP time series spu00004.eops are summarized below:
 - Data span: 1989.01–2012.12
 - CRF: fixed to ICRF-Ext.2
 - TRF: VTRF2005 was used as an a priori TRF
 - Estimated parameters:
 1. EOP: $x, y, UT1 - UTC, d\psi, d\epsilon$;
 2. Troposphere: troposphere gradients were estimated as constant parameters, and wet troposphere delays were modeled as a random walk process;
 3. Station clocks were treated as follows: offset as a random walk process, rate as a constant.
 - nutation model: IAU 1980
 - mapping function: VMF1
 - technique: Kalman filter
 - software: OCCAM v.6.2

4. Future Plans

In 2013, we are going to continue our regular processing of the VLBI sessions as well as giving lectures and practical training for students in a special course on radio astrometry. This course is a part of the systematic curriculum of astronomical education at SPb University.

References

- [1] O. Titov, V. Tesmer, J. Boehm, OCCAM v. 6. 0 Software for VLBI Data Analysis, In International VLBI Service for Geodesy and Astrometry 2004 General Meeting Proceedings, N. R. Vandenberg and K. D. Baver (eds.), NASA/CP-2004-212255, pp. 267-271, 2004.
- [2] V. Vityazev, I. Guseva, V. Kiyaev, M. Mishchenko, O. Titov, A. Tsvetkov. Celestial and Terrestrial Coordinates (In Russian), Manual on Astrometry, 301 p., SPb University, 2011.